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TRANSCRIPT OF PROCEEDINGS,

HEARINGS ON

COMPRESSED AIRBRAKE SAFETY DEVICES,

ADMINISTRATION OF SECTION 26310, VEHICLE CODE,

LABORATORY AND ROAD TESTING PROCEDURES.

October 31, ~~1961~~ - San Francisco [and]

December 5, 1961 - Richmond,

ASSEMBLY INTERIM SUBCOMMITTEE

ON

TRANSPORTATION SAFETY,

Edward M. Gaffney, Chairman

Frank P. Belotti
Joseph M. Kennick
Vernon Kilpatrick
W. Byron Rumford
Chet Wolfrum (ex officio)

Patricia A. Haag
Secretary

William F. Scheuermann, Jr.
Consultant

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ASSEMBLY INTERIM SUBCOMMITTEE
ON
TRANSPORTATION SAFETY

Edward M. Gaffney, Chairman

Room 1200, San Francisco State Building 10:00 a.m., October 31, 1961

Members Present

Frank P. Belotti
Edward M. Gaffney
Joseph M. Kennick
Vernon Kilpatrick
W. Byron Rumford
Chet Wolfrum

Staff Members Present

Patricia A. Haag, Secretary
Bill Scheuermann, Consultant
Tom Guilino, Sergeant-at-Arms

CHAIRMAN GAFFNEY: (Following call to order and introduction of members and staff) This is the second in a series of hearings of the Assembly Interim Subcommittee on Transportation Safety acting under authority and direction of House Resolution No. 227 (1961 Regular Session).(1) This hearing will be devoted to the subject matter of compressed airbrake safety devices, especially as it relates to Section 26310 of the California Vehicle Code. As a general framework for today's discussion, we will consider the history and administration of the code section, the testing procedures and manufacturers' and truckers' roles in this process.(2)

We have been confronted over the past several years with some colossal brake failures that involved the loss of human life, much less property damage. The idea behind placing this section in the statutes was to try to stop this needless loss.

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(1) This transcript has been condensed and edited by the subcommittee staff. A verbatim recording of the hearing is available for use in the committee office, Suite 4140 State Capitol, Sacramento 14.

(2) During this hearing, the committee unanimously voted to schedule a field trip on December 5, 1961, at which time it would participate in laboratory and road testing of various safety devices at the Engineering Field Station of the University of California at Richmond.

CAPTAIN HAROLD K. JACOBS, CALIFORNIA HIGHWAY PATROL: Section 26310 of the Vehicle Code was contained in Senate Bill 1073, signed by the Governor July 23, 1959 and became effective on September 18, 1959. I would like to point out that the bill did not include any money for conducting tests and did not contain authorization for additional personnel to do this work.

As soon as the bill was signed, the patrol went to work and recognized immediately that this was going to be a rather complicated task, so we started negotiations with the Department of Finance to obtain an additional engineer to work on the project, and the Personnel Board was asked to establish appropriate job classifications. During August, September and October, the available patrol personnel did work on the proposed regulations and we had numerous discussions with the manufacturers of braking equipment, vehicle manufacturers, trucking associations, and so on, to get some ideas as to how to proceed, and we developed a set of proposed regulations.

In October of 1959 the proposed regulations were mailed to the manufacturers and interested parties for comment. In December we held a public hearing, but the regulations could not be adopted, because there were many objections and quite a few suggestions as to changes that were needed. In January of 1960, we were given authority to hire the additional engineer and hired one. On March 23, 1960, the regulations were finally adopted and filed with the Secretary of State. I want to point this out because the Patrol has been criticized in some instances for not moving fast enough in this work: the Patrol had finished its part within six months after the section became law.

At this point the responsibility for setting up test procedures and buying test equipment became that of the University of California. And in

April of 1960 the University began purchasing test equipment and setting up test procedures and I understand they experienced many delays in the delivery of this test equipment. In May of 1960 there were some technical amendments, minor in nature not affecting the establishing of the test procedures. Also in May of 1960 arrangements were completed to use funds from our 1959-60 support appropriations to purchase test equipment. As I pointed out, there was no money in the law to do this so we had to use it out of our budget. May 12, 1960 we began formal negotiations with the University to proceed with purchase of equipment. In October of 1960 the delivery of the test equipment to the University was substantially complete, and at that time the manufacturers were notified that the University would accept devices for testing and that all of the devices received before January 1, 1961 would be tested as a group and certificates of approval issued on that group, and that all devices received after that date would be tested as a second batch and approved as tested.

On November 10, 1960, a contract in the amount of $20,000 was signed and returned by the University for conducting the tests. On December 5, 1960 this contract was approved by the Department of Finance. January 1, 1961 the devices submitted were tested as they had been submitted. February 1961 our Department recognized that the University had a shortage of manpower, so we assigned a full time qualified traffic officer to assist the University in the conducting of the tests under the supervision of the laboratory personnel. In May 1961 the reports began coming into our Department from the laboratory. In August of 1961 the manufacturers were notified to submit the additional fees if necessary to pay for the test. On September 13 we received the last reports from the University on the first devices which had been submitted, and on September 15 of this year the

certificates were issued and an approved list published.

This started the clock on the law, and as of March 15, 1963, all vehicles equipped with airbrakes will have to be equipped with one of these devices.

WARREN HEATH, AUTOMOTIVE ENGINEERS, CALIFORNIA HIGHWAY PATROL: Current law requires these devices to apply to wheel brakes and there are two types of systems acceptable under that provision. One shuts off an air line if a diaphragm ruptures or if a wheel line breaks and prevents any further air in the system. The second automatically applies brakes if an air loss occurs. There are other devices available for slowing down a vehicle such as retarders and improved drive shaft brakes, but these are not permitted under present statutory working. Ninety six devices were submitted prior to January 1, and we approved fifty six. This doesn't mean that we approved fifty six systems because some systems take several devices.

ASSEMBLYMAN RUMFORD: But you approved two basic systems?

MR. HEATH: Yes.

ASSEMBLYMAN RUMFORD: Are you satisfied that this will correct some of the major accidents on the highways where trucks have run away because of faulty braking systems?

MR. HEATH: It will correct problems where runaways have been due to loss of air pressure, but it won't correct runaways due to the driver going down grades too fast and burning up the brakes.

ASSEMBLYMAN RUMFORD: Does this apply to autos?

MR. HEATH: No, just airbrakes.

ASSEMBLYMAN BELOTTI: Could the same equipment apply to hydraulic brakes?

MR. HEATH: Not these particular types of devices.

ASSEMBLYMAN BELOTTI: Is there nothing contemplated to check the loss of hydraulic fluid?

MR. HEATH: Some cars have separate front and rear wheel brake systems; if you use the rear wheel brakes you don't lose the fluid.

ASSEMBLYMAN BELOTTI: Do the majority of trucks use compressed air?

MR. HEATH: Yes, the heavy duty ones. There are a few that use vacuum brakes, but not usually overloaded equipment. There are also some that use air over hydraulic: air pressure to operate the hydraulic system. Others use a hydrovacuum to operate a hydraulic system.

ASSEMBLYMAN KENNICK: Is there any conglomerate of devices that makes installation cheaper in one way or another?

MR. HEATH: Yes. I don't know the exact cost of these various items of equipment, because we didn't look into the cost factor, but I believe the prices range from about $25 per axle to $175 to $200 per axle. Our approved list gives diagrams of acceptable systems and the truck operator can pick which system he feels is the most suitable. The 40 devices not approved would fit into the systems if they had passed the laboratory tests. They were of a type which would have met the principle in the regulations, but they didn't pass specific tests because of leakage problems or something

ASSEMBLYMAN WOLFRUM: What kind of standards did you set on these devices? How did you arrive at the standrads that you were going to set for a device?

MR. HEATH: When we started developing the regulations, we wrote brake manufacturers and others asking for information that would help us in establishing standards. Then on the basis of some of the information we received and information we had on braking systems, we started establishing minimum requirements: temperatures under which the brakes should operate; flow rates that they should operate at; and, with respect to spring brakes

and other types of air brakes, the force that would be necessary that these devices would have to meet.

ASSEMBLYMAN WOLFRUM: Was there general agreement as to the standards you set for a device among the automotive industry?

MR. HEATH: Not entirely. They felt that some of the things we were setting didn't quite fit in with how they thought a vehicle should be equipped.

ASSEMBLYMAN WOLFRUM: Would you say there was considerable disagreement among members of the automotive fraternity on this subject?

MR. HEATH: I don't think there was. In first preparing the regulations they were working with us in developing systems which would fit in with the present types of airbrake systems, and there were differences of opinion on the way to do it, because there are several possibilities.

ASSEMBLYMAN WOLFRUM: Did you evaluate devices that are presently in use?

MR. HEATH: Only by information that was brought to use at the hearing at that time. We didn't have the staff for planning a full series of tests on all possible devices that were available.

ASSEMBLYMAN WOLFRUM: Were there any devices presently in use that were turned down?

MR. HEATH: Yes, quite a few.

ASSEMBLYMAN WOLFRUM: Isn't this a violation of the law, to use an accessory on a vehicle that is not approved by the Highway Patrol?

MR. HEATH: No sir, unless the law specifically requires approval by our Department, and the only approval required on braking systems is just these airbrake safety devices. Some of the devices that have been used for some time had easily correctable faults that the manufacturers

have worked on and have submitted new samples for testing.

ASSEMBLYMAN WOLFRUM: I am still concerned a little about the standards that were set.

CAPTAIN JACOBS: I think there was general agreement on the regulations. Naturally, when you are setting up standards for the approval of devices, I think each manufacturer has a problem that he is going to have to whip, and he is going to hold out for a type of standard that he can meet. And you have to get agreement with all of the people; you can't just take one device and write your regulations to fit that device. I think you have to write regulations wherein devices will fit all trucks. You have to have basic principles included in these regulations, and there were some manufacturers who didn't agree with some of the requirements. We checked these with experts throughout the State, people who have been in the braking business for years, and they thought, in some cases, that we were being too lenient in that direction, rather than too restrictive. But we did have very good general agreement.

ASSEMBLYMAN WOLFRUM: Was there a committee set up to go into this proposition?

CAPTAIN JACOBS: Yes sir, we had people out here from International Harvester, General Motors, Bendix, Wagner, all of these big braking companies, and we had the manufacturers and truckers from California. Anyone who had any interest at all was welcome at any time.

CHAIRMAN GAFFNEY: Where a braking system is in perfect condition and the driver hits a grade like the Grapevine, and by abuse of that system he has no brakes, there isn't much recourse. Even with the supplemental device that we are hoping for and praying for are there certain cases where there would be no supplementary stopping of that truck.

MR. HEATH: That is right. Where the vehicle is abused going down grade to where the brakes fail, none of the devices we have approved can help that situation.

ASSEMBLYMAN BELOTTI: Is there anything to indicate that most runaways are due to neglect on the part of the driver as against mechanical failure beyond control?

CAPTAIN JACOBS: I don't think we have any statistics to prove this one way or the other. Quite often it is impossible to tell just what existed before an accident; things are so destroyed and beat up. These systems protect the braking system down to the wheel. When the driver runs out the brakes and he has none left at the wheels, the only thing left to do is to throw out the anchor, if he has one, because the braking system is gone.

CHAIRMAN GAFFNEY: What directive has been given the Patrol or what directive can they initiate themselves to cope with the problem of out of state trucks, improperly equipped?

CAPTAIN JACOBS: We have an informal Attorney General's opinion that this law does apply to interstate vehicles, and of course the enforcement will have to be based on inspection at such installations as Wheeler Ridge, Cordelia and three others planned on the main highways and on a spot-check basis at the other locations.

CHAIRMAN GAFFNEY: And it's quite a problem with the lack of Patrol personnel.

CAPTAIN JACOBS: We can't get all of them, but I think we are getting enough to make them aware of it.

CHAIRMAN GAFFNEY: With 300,000 trucks we have placed a tremendous responsibility on the Patrol without giving them the tools of operation, instrumentation of the Patrol itself. The Patrol today is not properly

manned for the mileage of our highways and the immensity of traffic on our highways. And in the initiation of this legislation, there was no provision for the research and the setting up of standards.

ASSEMBLYMAN KILPATRICK: What is the experience on runaways over the Tehachapis since you put in the escape ramp on the south slope?

CAPTAIN JACOBS: I really am not prepared with statistical information this morning, but I don't believe the escape ramp would reduce the number of runaways. It would reduce the severity by giving them an opportunity to pull off and take advantage of this deceleration ramp.

CHAIRMAN GAFFNEY: Has the trucking industry been advised of the location of that ramp?

CAPTAIN JACOBS: Yes. It is posted as you descend the grade.

CHAIRMAN GAFFNEY: Should this committee investigate the possibilities of further escape ramps on the Cuesta and the Grapevine roads? I think the committee should have first hand knowledge, supplemented by the information we can get from the Division of Highways.

ASSEMBLYMAN KENNICK: So move.

ASSEMBLYMAN KILPATRICK: Second.

CHAIRMAN GAFFNEY: Those in favor, "aye".

ALL: Aye.

CHAIRMAN GAFFNEY: Any opposed? So ordered.

HIGINO PAULA, UNIVERSITY OF CALIFORNIA, RESEARCH ENGINEER: The manufacturers requested tests through the Highway Patrol and we were notified, received the devices and applied the procedures that we had worked out. There were two or three samples of each type of device, and we established the procedures according to the regulations set up by the Patrol. This was our first mission at the laboratory. Then we reported

the tests results to the Highway Patrol and they made the decision on the approval or nonapproval of the device.

We started working quite hard on this project but we had a main difficulty: we didn't know how many devices we would be receiving. The Highway Patrol gave three months to the manufacturers to send their devices, but as usual, most of the devices came at the end of the three months. As a matter of fact, we had scheduled five or six tests and by December 31, we had about 90 tests scheduled. So most of the devices came in the last three weeks. And we needed very badly the devices to set up the procedures, because we didn't know exactly what type of devices we were going to receive. Usually we set the procedures before we even go into any testing but because there was urgency on this testing, the procedures were set up at the same time that we were doing the actual testing. That is a very lengthy process, and we don't have any regulations, ASTA specifications as for headlights, or for any of the special devices that have been on the market and tested for a long time.

ASSEMBLYMAN BELOTTI: Are the tests made on actual vehicles?

MR. PAULA: No. All the tests were made in the laboratory. There were one or two exceptions where we would test the device on a vehicle after the lab test.

CHAIRMAN GAFFNEY: If the Patrol thinks that a device should be absolutely tested on a heavy laden vehicle.....

MR. PAULA: It's their prerogative to say they want the device tested on the vehicle, and we will cooperate with them.

ASSEMBLYMAN WOLFRUM: You took the regulations set up by the Highway Patrol and developed tests to meet these standards?

MR. PAULA: That's right.

ASSEMBLYMAN WOLFRUM: Was there any accepted general engineering

standards that you set up on these tests?

MR. PAULA: No, because, unfortunately on airbrake safety devices there were no ASTA standards. And that further complicates it because we had to do all the research work and the writing on how to conduct the tests, as well.

ASSEMBLYMAN WOLFRUM: You are pioneering here.

MR. PAULA: We suppose we are.

ASSEMBLYMAN WOLFRUM: Was any consideration given to the experience and use of any particular devices as far as you were concerned?

MR. PAULA: No, it was not.

CHAIRMAN GAFFNEY: Mr. Taylor, when did you make application for the testing of your particular device?

RALPH TAYLOR, NU-VALVE CORPORATION, SAN FRANCISCO: We did, in plenty of time. We were not one of the late applicants, I believe.

CHAIRMAN GAFFNEY: What was the reply of the Highway Patrol?

MR. TAYLOR: That we did not qualify.

CHAIRMAN GAFFNEY: Did you send a model of your device to the Patrol to be tested by the University.

MR. TAYLOR: We did.

CHAIRMAN GAFFNEY: Approximately what length of time from the date of application to the date of rejection transpired?

MR. TAYLOR: A year, roughly, maybe short of that.

CHAIRMAN GAFFNEY: Did you receive a letter of rejection that your device did not meet with the standards of the tests that were being promulgated.

MR. TAYLOR: Yes, we did. The letter stated in one particular we failed to qualify. We were allowed 10/100ths of a second in which to delay the system; that is, if our device were inserted in a line, we would qualify

if our device held up the operation by 1/10th of a second, and we failed to qualify because we held it up an additional 4/100ths of a second. That is a distance it would take a truck to go about 1 foot if the truck were traveling about 20 miles an hour and the brakes were applied.

CHAIRMAN GAFFNEY: Do these figures apply to a piece of equipment like a municipal railway car or are you speaking now of the application to a heavy semi-trailer and truck?

MR. TAYLOR: Well, I think probably a loaded truck. I don't know how much less a loaded bus weighs than a loaded semi. It depends on what the semi is carrying, I presume.

ALAN ANDERSON, PRIVATE TRUCK OWNERS' BUREAU OF CALIFORNIA: There are many different sizes of semis and combinations and I think you can't draw any comparison between the two.

CURTIS L. FENT, FORMER SUPERVISOR OF AUTOMOTIVE EQUIPMENT, SAN FRANCISCO MUNICIPAL RAILWAY: Our loaded coaches in San Francisco, with swing-loads, will run 9 tons, including the weight of the coach.

CHAIRMAN GAFFNEY: Approximately how many persons?

MR. FENT: A swinging load is where they are standing in the aisles; 75 people.

CHAIRMAN GAFFNEY: Standing in the aisles, where they are violating the law. What happened to this application, do you think it was properly tested and thoroughly tested, and always with the thought in mind that the Patrol and the University were engaged with a problem of highway trucks, primarily.

MR. TAYLOR: I was utterly amazed at the ruling of the Highway Patrol. I am happy to learn here this morning, however, that in the beginning they didn't furnish enough money, and that they are inadequately manned, and I understand also that the University of California was not properly set up.

I am happy to hear that, because, as I say, I am utterly amazed that this device of ours failed to qualify, a device that has been used in the City and County of San Francisco for all of these years, travelling 50 million miles a year for something like ten years. The present head of the City buses says that there has never been one incident of failure of this device in over a hundred million miles of operation.

ASSEMBLYMAN WOLFRUM: The assumption seems to be here that this device was only used on the municipal railway. Has it been used on other trucking interests?

MR. TAYLOR: The Bodie Gravel Company swears by it, and the scavengers in San Francisco say they wouldn't be without it.

CHAIRMAN GAFFNEY: What is the cost of installation?

MR. TAYLOR: The cost of the device is $8.00, less if you buy in large numbers. The installation is most simple, all you do is undo the line, and insert this in the line and hook it back up. You don't have to even be a mechanic to do so.

CHAIRMAN GAFFNEY: Wait a minute, I'm not going to buy that do-it-yourself thing.

MR. TAYLOR: The maintenance itself is practically nothing and the theories of the municipal railway in San Francisco has been that when they have bought new trucks, they have taken these devices off the old ones and put them on the new ones. And many times I have had people say to me, "The inventor wasn't very smart, he built it too good, there is no replacement value, there is no built-in obsolence." It wouldn't cost more than $25 a rig. It is almost impossible to install it wrong.

ASSEMBLYMAN RUMFORD: Within the realm of these two basic systems, where does your device differ from the 56 devices that were approved and

why do you think the Department told you that it didn't qualify?

MR. FENT: It falls under the protective devices, preservation of air, enabling the operator to bring the vehicle to a stop with the remainder of his braking efficiency. It doesn't take the control from the operator at any time.

ASSEMBLYMAN RUMFORD: They certainly must have given you a reason why they refused it.

MR. FENT: I don't like to appear biased, but I was under the impression that this laboratory test would have been a realistic test held by someone who was familiar with automotive brakes and their operation. Yet, I find that it was done by a physicist, or an electrical engineer.

ASSEMBLYMAN RUMFORD: Well, they tested 56 others and they passed. Did the Department indicate why they did not accept your device?

MR. FENT: They gave us quite a lengthy discussion here on their laboratory tests and I take quite a number of exceptions to it. If you would like me to go into those at this time, I would like to have the Highway Patrol answer this question: how many velocity type devices were approved as against the spring loaded devices? Because I am of the opinion that the Highway Patrol is biased against the velocity type system, for the same reason that I was biased against it when it was brought into my office. I looked at it, I shook it, the ball shook around in there and it was so simple that I actually refused to have anything to do with it until the pressure was brought on me by my immediate superior. Then I took it under a little closer observation, looked at it, thought it had possibilities and I tested it for a period of over 15 months. And I have yet to make it fail and I can't understand if it were properly installed on a vehicle and tested. Laboratory tests don't indicate the efficiency of this valve.

I found that it was impossible to set up a system on a bench that would approximate the plumbing, the air system on a coach. A valve that would fail on my test bench would go out and operate on a coach.

ASSEMBLYMAN RUMFORD: Has your device been accepted by any national safety organization in the United States or anywhere?

MR. TAYLOR: Our device is being used in Pittsburgh on all the buses. We sell some in Canada.

ASSEMBLYMAN WOLFRUM: I would like an explanation from Mr. Fent as to why it was turned down.

MR. FENT: In the first place the laboratory test wasn't realistic. We realized that we couldn't possibly pass that test. It was unrealistic, the requirements were unrealistic, nothing compared to what you experience in actual operation.

MR. TAYLOR: What you are saying is that the regulations written by the Highway Patrol and submitted to the University were unrealistic.

MR. FENT: In the first place, I spoke to Captain Jacobs at the inception of this thing, because I realized the problem that Captain Jacobs had in setting up specifications for an unknown quantity. No one could set standards for it. I suggested at that time that the Highway Patrol license or give permits to the ones that had satisfactory performance operations at that time, and proceed on that basis, and in so doing observe them on the highways, see what could be demanded, and what should be demanded of each unit and then set up the specifications.

Now, you have heard testimony that the Highway Patrol cooperated with all these different people. Here is a portion of a letter from the Automobile Manufacturers Association to the Highway Patrol, dated December 1, 1959; "Extensive road testing is necessary in the development of any device. Laboratory tests suitable for gauging the product's acceptance are then

devised. No general requirements for such laboratory tests can be established because they will depend on the type of device, its normal operation and other details which will call for application of knowledge gained through previous experience and because no detailed test standards exist to cover all such devices, the industry recommends that when standard airbrake devices are involved which have a long record of satisfactory performance they be approved on the basis of reports submitted by their manufacturers covering previous testing and operation experience." So the laboratory test was superfluous, it meant nothing.

ASSEMBLYMAN RUMFORD: Mr. Fent you used the term unrealistic and I don't know just exactly what you mean by the interpretation of the word. It seems to me it is either real and functional or it's unworkable. If it is unrealistic, it is unreal and it wouldn't be applicable to the 56 that they have adopted. So it isn't unrealistic.

MR. FENT: That is why I would like to know the percentage of velocity type valves. All velocity type manufacturers are faced with the same problem. The other people are not.

ASSEMBLYMAN RUMFORD: But it is not unrealistic for braking within a certain limited number of feet.

MR. FENT: This law describes two absolutely unconnected systems. An attempt was made by the Highway Patrol to set up rigid specifications for two devices that have not a similar function. One of them stops the vehicle, the other merely saves the air and leaves the operation with the operator. The ones that save the air are the ones that I have termed the velocity type valve. This test that was set up for the velocity type valve was very critical. The delay in air travel; 4/100ths of a second; was deemed to be one thing that condemned our unit. Now in actual operation,

who would measure 4/100ths of a second in the operation of it. That's why I say they are unrealistic.

On the other hand, to my knowledge, the spring loaded devices, in order to set up a stopping distance, the Highway Patrol was faced with another problem. They couldn't get an accurate or a reliable stopping distance for that device because it was out of the control of the operator entirely. The air had to leak down to a certain pressure and with a given load. With a given amount of brake pressure they would stop at a certain distance. If the load were increased the vehicle would roll on, so the stopping distance was thrown out and in the specifications as they are written today the only test you have on the ability of that device to stop is a torque test on the device itself while it's clamped in the vise. That is one of the bases for my statement that they are biased against the simple air protective device at the expense of this more expensive device which in itself could create an entirely hazardous situation.

ASSEMBLYMAN RUMFORD: How many such devices were tested?

MR. FENT: To my knowledge from seeing the list there was only one.

CHAIRMAN GAFFNEY: Mr. Fent, while you were automotive superintendent of the Muni, how long was the Nu-Valve in operation on your vehicles?

MR. FENT: Sporadically from 1951. I was hampered by funds.

CHAIRMAN GAFFNEY: You had about 7 years experience with this particular device. During that time were there any occasions of a runaway bus on a grade in San Francisco, and the device was brought into operation and saved that vehicle, saved the passengers?

MR. FENT: I have no knowledge of how many potential runaways there were, but the cycle of failure of diaphragms and brake hoses on our vehicles didn't diminish any, but the fact that this device was installed, prevented

accidents. My first objective was to get the Clay Street operation equipped with them. One diaphragm on that line that I looked at was blown out and it was a potential runaway coach. This device had saved it so that even the operator had not defected that coach. In other words, the procedure is to defect whatever you find wrong with the coach at the end of the tour of duty. He didn't consider it important enough to even make out the defect card.

CHAIRMAN GAFFNEY: The thing that was saving him in the meanwhile was the application of this device?

MR. FENT: That is exactly what happened.

CHAIRMAN GAFFNEY: Is it automatic application or is it by lever or button?

MR. FENT: It is entirely automatic by the velocity of the air going through. A normal sized diaphragm requires a certain amount of air to fill it; that isn't sufficient to set up velocity enough to pick up this valve and make it operate. When an exceedingly large opening occurs, this velocity is increased and the device comes into work, and it will do it every time the brake is applied. It immediately stops it so there is no loss, just a little "ssst"; that is all you'll hear. The other three remaining brakes of the system are operated within the efficiency of the percentage of braking of all the wheels. If you have brakes on four wheels you have three left; if you have brakes on six, you have five left; or if you have two failures -- which rarely happens -- you still have the percentage of your braking effect that you can use.

MR. TAYLOR: Mr. Fent left out a very interesting paragraph in this letter from the AMA which I think should be read. The patrol says they sought and received all of this advice and they cooperated with all of the advice they received. I submit that the AMA is a considerable organization, and they say: "The industry recommends airbrake protection for single trucks and buses which assures that the brakes on at least one axle

can be applied at will by the operator in the event of a failure associated with any axle. Systems providing this protection.....do not provide for automatic brake application unless failure occurs in the protection system proper. This is an important premise of the industry's position that all automatic application of brakes is hazardous and must be avoided to every extent possible. It is further believed that these systmes can comply with the legislation upon which proposed regulations rest."

Our device is automatic and it leaves the control of the braking system in the hands of the operator, and this is exactly what this AMA suggestion says. It further says that such devices as spring loaded devices which go into effect automatically, and if they function lock all the wheels, are hazardous on the highway.

So I think it would be very proper for Captain Jacobs to explain why they disregarded these suggestions entirely and did exactly the opposite. I would like also to have the captain explain why, when the legislature wrote a bill which says that a device must be installed upon a truck which will save the air in the event of a broken line or a ruptured diaphragm, they then wrote regulations which specifically preclude a device which does exactly what the law says. They wrote regulations which specifically preclude this device, and the specific device precluded is ours, and our device is the one which has been used by the Muni railway for a hundred million miles with no failures. I would like him to go into that.

CHAIRMAN GAFFNEY: A broken line simply depletes the air. How can you save the air when you have a rupture depleting the air, and depleting it quickly? Now don't tell me you can still save air that you don't have; that doesn't make sense.

MR. TAYLOR: If a diaphragm is ruptured or a line is broken so that all of the air which would come to that line was run into the atmosphere, our device would save the supply of air.

CHAIRMAN GAFFNEY: I don't like the harsh condemnation of the University testing nor of the highway patrol. I know that while they might have been in error in your case, they have been doing a marvelous job all in all and under duress, mainly lack of funds. But the job has been a dedicated one.

MR. TAYLOR: I had a question about the conclusions they arrived at in their testing which didn't seem to run along with the AMA suggestions.

CHAIRMAN GAFFNEY: Well, the legislature is not running on the suggestions of any particular group. We will take into consideration suggestions from any and many groups, but to say the AMA is the criteria and the dominant factor of our deliberations is not factual. We will take into consideration their views, but they don't dominate our committee nor do they dominate the legislature.

CAPTAIN JACOBS: As I recall, Mr. Taylor was reading from a letter dated December 1, 1959. Our regulations were not filed until March 23, 1960, so all of the recommendations contained in that letter were evaluated by our department and to the best of my knowledge most of them were accepted and I think we can show this by the regulations that have been adopted.

MR. HEATH: One of the other statements made by the AMA was that they would not approve of automatic application of brakes on the towing vehicle. This we took into account. The reason they didn't approve of it is that the brakes could automatically apply without the driver expecting it and without application of the brakes on the trailer. In the letter they mention that it is an important premise of the industry position that all automatic application of brakes is hazardous and must be avoided to every extent possible. Our original proposal in accordance with the law specified automatic application of brakes on all vehicles as a second type system. Then after we received testimony at the hearing from the AMA and the truck operators showing that automatic application under some conditions could be

a hazard, we amended our regulations to permit devices which could be controlled by the truck driver so that you wouldn't get a sudden automatic application that you didn't expect and one that could throw a combination of vehicles out of control. This we did take into account.

We realize that extensive road testing would have been desirable, but we didn't have the facilities for conducting all these road tests when we first got into the program. Rather than hold up the program, we went ahead and collected all the data available from the various manufacturers and truck operators, assembled what studies had already been made, and on the basis of this, summarized into what we considered a reasonable system, using previous studies.

Then as the regulations were developed and we began testing devices, we made additional road tests either to confirm or reject some of the conclusions we made on the basis of the previous studies. Unfortunately, we were unable to make the tests before we did anything about regulations, and this would have been the ideal way to do it. But we did it concurrently.

CAPTAIN JACOBS: Extensive road tests were recommended and this would take a considerable amount of time. The Department was pressured, not only by several legislators, but by the newspapers and device manufacturers to get these regulations adopted as soon as possible and put into effect. You can't have all of these things and still get the law into effect as soon as possible.

ASSEMBLYMAN KILPATRICK: Mr. Taylor, is your interpretation of the AMA letter at variance to Mr. Heath's?

MR. TAYLOR: I think so. I think that the AMA letter stresses and highlights and specifies certain things, one being extensive road testing. I wonder if they road tested ours.

CHAIRMAN GAFFNEY: But in what way did they road test it? Did they road test it on a heavy semi-laden vehicle, a truck on a grade, or did

they test it on a coach, on an electric or gas driven coach? In other words, specify your question of how they tested it as to the ability of this device to stop a vehicle after its air process has failed.

MR. TAYLOR: I was wanting to be even more simple than that and ask them if they road tested it at all.

CAPTAIN JACOBS: Yes, we have road tested it. We have the results of the test here, and it seems to me we are now getting down to cases. I would suggest that Mr. Taylor read aloud the results of the test report to see what the laboratory found and we will give you the results of our road testing.

MR. TAYLOR: It is my understanding that this report we received dealt only with the simulated tests in the laboratory. So, I do not understand what I am to get from this simulated testing in the laboratory in relation to the road testing.

CAPTAIN JACOBS: One of the sentences in Section 26310 provides that, "No device shall be approved by the Department that creates a hazard on the highway or increases the stopping distance of a truck or combination of vehicles."

MR. HEATH: Our road tests of Nu-Valve were conducted the same time we road tested other devices performing similar functions. The particular Nu-Valve we tested was their Model H. They also have a Model S which wasn't submitted in time for this test. We installed their H model on a DMC suburban type transit vehicle as wheel protection devices on the rear axle and axle protection on the front as provided in the regulations. We made four tests from approximately 20 miles per hour. In the first test at 20 miles an hour upon sudden application of the brakes, it took 138 feet to stop the bus; without the devices in, it took approximately 30 feet. We repeated the same test: maximum brake application, suddenly applying the brakes, again at 20 miles per hour. It took 153 feet to stop. Then it was tried twice with gradual application

on the assumption that sudden application may have caused the device to activate when it shouldn't have, and in the gradual application at 17 miles per hour it stopped in 38 feet. The second test at 25 miles per hour it stopped in 90 feet. It was on level ground.

This was to confirm the laboratory report wherein the laboratory had set up a simulated system with two brake chambers the same as those on a vehicle and installed the two wheel protection valves in the system. According to the test reports that were delivered to Nu-Valve, their device would interfere with the brake application under each of these conditions. In other words, when you would suddenly push the pressure down, the air flowing through would cause the valve to shut off even when there was no break in the line, and this apparently is what happened in this road test. The model H valve is the only one we tested. They do have a Model S which they have submitted since then, but we have not tested it yet.

CHAIRMAN GAFFNEY: That model you tested was specifically made for bus application?

MR. HEATH: I believe the instructions didn't limit it to buses. It could be for any type of vehicle.

CHAIRMAN GAFFNEY: You tested it on a bus, though.

MR. HEATH: We did test it on a bus.

CHAIRMAN GAFFNEY: Did your H model come out subsequently to the testing we are speaking of?

MR. TAYLOR: No, but it is a similar device, maybe a little difference in design, but very little.

CHAIRMAN GAFFNEY: And the application of it and its performance you would say is the same as the model they tested?

MR. FENT: Referring to the test procedures, you will notice that they state they used two 50 square inch rotochambers for the test. At current production there is no such an animal on the front axle of any

vehicle made today. That's an 8 inch chamber and it is a little above some of the average rear chambers. The lab tests subjected this valve to a test where the volume of air that passed through that valve is four times greater than would have been experienced on a coach, because they would have probably had five inch diameter instead of eight inch diameter diaphragms on there, which would necessarily reduce the velocity of air through this valve. The reason we had two types of valves was for that simple reason.

Some brake systems have larger capacities and they involve a higher velocity and the lower more sensitive valve would pick up under those conditions, but we wouldn't instruct an owner to install them on a vehicle of that type. It is necessary to grade them. That isn't a cureall for all. We have to have two to satisfy all the different situations we have. One truck might require one and another truck might require another, depending on the size and area of their chambers and plumbing.

CHAIRMAN GAFFNEY: And the one submitted for their inspection was the one applicable to the kind of vehicle they tested it on?

MR. FENT: I think that was the most sensitive valve and should have been used on a larger diaphragm.

ASSEMBLYMAN KILPATRICK: They used a vehicle not suited to the particular valve?

MR. FENT: I would maintain that. I am not positive about the type of size of diaphragms they had on that particular program.

CHAIRMAN GAFFNEY: Was the type they used marked H?

MR. HEATH: Yes. We used the largest size chambers available for that particular test feeling that if the device passed that test with the largest size chamber, then it would certainly be satisfactory with a smaller size. We ran the test with the standard small size brake chamber, type 24 on this particular bus. I believe the instructions that they have in mind for installing these on buses showed a type H on the front.

CHAIRMAN GAFFNEY: Did you take into consideration the demonstrated practicability of this device used by a reputable transportation entity, or did you just say the laboratory says this and the road tests says that, and therefore we don't think it is any good and that is that?

CAPTAIN JACOBS: I believe that the information was considered, but as I understand it they claim a period of seven years without mishap with this device. We have no evidence that there ever was a broken line or a ruptured diaphragm where the device was called into play. When you start testing things, you can't just rely on statements. I think you have to submit them to tests. These valves have to be approved for all types of vehicles, so when we approve a device we can't just say that this will work under this one specific situation; it has to work for all vehicles or you are going to create hazards. You are going to create more problems than you solve.

CHAIRMAN GAFFNEY: That may be true, but it was mentioned this morning that in one instance the diaphragm was practically gone, and the operator was unaware of the failure of the diaphragm because of the practicability of the device in stopping that vehicle. You don't have any demonstrated criteria of how effective this device was, but it stands to reason that there were numerous occasions where there were brake failures and that this instrument might have caused that unblemished record of never a loss of life. There has never been a loss of life, has there?

MR. FENT: There has never been a loss of life, not through brake failures and in these areas. Our records show that the cycle of failure on these vulnerable spots was exactly the same after we installed the safety device as it was before, but the accident rate was the thing that was controlled. There were no accidents after this installation. That is my experience, and the purchasing department records will indicate

the number of failures that we had on diaphragms and brake hoses as to the number that we were forced to purchase in addition to this safety device in order to be reasonably safe because we had a program established where we changed diaphragms every five months.

Now Greyhound and some of these other operators laugh at me for making a statement like that; they think I'm entirely mad. The brakes are called onto cycle about 100 times more in our operation than they would be on the highway. Consequently, those failures are more frequent, but they existed just the same after we put this safety device on as they did before, but there were no attributable accidents after that.

ASSEMBLYMAN KILPATRICK: In the event that this device continues to be disapproved, does that in any way prevent them from using it on city buses?

CAPTAIN JACOBS: I haven't explored this yet with the Attorney General's office. I don't believe it does, but this might be room for legislation, not mentioning this particular device particularly, but in the future, devices which may create hazards and which might interfere with normal brake operation probably should be prevented by law.

CHAIRMAN GAFFNEY: Feeling that you have not had the proper tests made, would you like to have this committee request the Patrol and the University lab to review your application and give you another chance?

MR. TAYLOR: We surely would. I do not say that we haven't been treated justly and fairly, but I would suggest in all due deference that Captain Jacobs and his men could have made an error.

ASSEMBLYMAN KILPATRICK: Mr. Taylor, I am wondering if you have any specific recommendations where you feel that the test has not been sufficient?

MR. TAYLOR: I would suggest in accordance with the information and recommendation that I have among the industry that a good deal of attention and weight be given to actual practical road tests. When the

Muni installed and used such a device for such a long period of time and when they all stand up and say that the device has never failed, I think that is a considerable test in itself. I would say in general that I believe the simulated tests in the laboratory should be as nearly accurate to the actual working conditions. For example, these gentlemen admit that they tested our device with a diaphragm that uses four times as much air as the trucks upon which this device is designed to be used, and they defend that position by saying we want this device to work under all conditions and if someone did come up with one of those big diaphragms we would want it to work there. Well, our answer to that is that we would just have a little larger or smaller device.

ASSEMBLYMAN KILPATRICK: Do you want both of these models tested on the type of vehicle that you would name?

MR. TAYLOR: Yes, I think that is fair.

CHAIRMAN GAFFNEY: Couldn't we make some arrangement to test vehicles that are already operating with your device?

MR. TAYLOR: I am in favor of any test that shows whether or not this device will work.

MR. E. J. KELL, INVENTOR AND MANUFACTURER OF NU-VALVE: We have three types of valves, the H, the S and the W. Now the H valve is only designed for the 5½ inch diaphragms on the front axle and our instructions will show it and say it is the most sensitive valve we have. The H valve is designed for trucks and on the front axles we have the H valve. The W valve is designed for heavy duty equipment. They all have to pass different amounts of air. They have a ten cubic foot per minute leak in their specifications, which is rather assinine. Considering the fact that there is twelve cubic feet pumped into it we submitted only the most sensitive valve we had. But if they put the S valve or the W valve there it wouldn't come into play.

When you put the W valve in there you could probably pass 40 cubic feet of air. That is why we didn't send it, because we knew we were licked before we started. The only way we have a possible chance of passing that 10 cubic feet is with the H valve. Forget that 10 cubic feet, because that is not realistic.

CAPTAIN JACOBS: In reply to your suggestion of retesting the valves, the department will be happy to do this. We would like to set up the tests and invite the committee to actually see what happens. We would like the committee to invite outside engineers, experts on braking systems, to see what happens so that you can get an unbiased opinion. We will set up laboratory and road tests; we will follow instructions of the manufacturer provided that it will be operated under actual operating conditions that you will meet upon the highway with various types of vehicles.

MR. PAULA: First we used these big chambers not only with the full stroke, but with 25% stroke, which implies a much less displacement, and the results were still the same. Secondly, we used big chambers and the highway patrol used the very small chambers on the road test and apparently the results were queen size. So it doesn't seem to be a matter of small chambers or big chambers, and as far as we are concerned at the University, we are checking another of their valves and the results are the same. So either we decide to change the procedures that we are using, or else it is just worthless to test anymore, because the tests will be just repetition. We didn't overlook anything.

CHAIRMAN GAFFNEY: With no aspersion on the scientific end of it in the lab, would the committee go along with the suggestion that the patrol has graciously offered to give them further road tests?

ASSEMBLYMAN KILPATRICK: I so move, Mr. Chairman.

ASSEMBLYMAN WOLFRUM: Second.

CHAIRMAN GAFFNEY: It has been moved and seconded. All those in favor?

ALL: Aye.

CHAIRMAN GAFFNEY: Opposed? The ayes have it.

MR. KELL: I want to quote from a report from the same laboratory taken on February 14, 1950.

CHAIRMAN GAFFNEY: I would rather you wouldn't, I will tell you why. Because if we bring in something that was controversial several years ago in regard to the University and its lab facilities, we are only liable to complicate the whole picture.

MR. KELL: Now this was on a six axle rig, not a bus, held over at Fruehauf's. We installed 10 valves; we didn't take time to install them on the front axle. With the valves installed we stopped in 48 feet. Of course that is an impossibility because we can't shorten the stopping distance, but Professor Finch covered that in another statement: "On the opinion noted under condition 3 and 4 when three lines are broken the test valve effectively sealed the lines so that the braking efficiency was not impaired. And comparison of the stopping distance under conditions 1 and 2 does not indicate that any reduction in the braking was caused by the installation of the valve. Difference in results in the two arrangements are within experimental error." That is why he stopped at 48 feet with my valves installed.

I think that before the test is held we should get together with the professor here and look over how he is going to test them.

CHAIRMAN GAFFNEY: He isn't going to tell you in advance what he is going to do.

MR. KELL: I want to be sure he is going to use the right size diaphragms.

MR. PAULA: Well, your device didn't fail just on these particular cases, it didn't operate on several other cases.

MR. KELL: But it has never failed to operate in actual operation.

MR. PAULA: Well, I don't know how anybody can check that, as a matter of fact. If it didn't fail on the truck, it shouldn't fail on our system, and we can prove that.

ASSEMBLYMAN WOLFRUM: Is it possible to get some outside engineers to look at this testing program as to whether or not these are valid tests for this type of equipment?

CAPTAIN JACOBS: I believe they have already checked it.

ASSEMBLYMAN WOLFRUM: Are they in agreement with the tests that are being made?

CAPTAIN JACOBS: I am not aware of any objections.

ASSEMBLYMAN WOLFRUM: I just wanted to be sure that we have a testing program that is acceptable to the industry generally.

CAPTAIN JACOBS: It has been accepted generally and I don't know of any objection.

MR. HEATH: We have just had questions as to testing technique.

MR. PAULA: We had three or four major manufacturers coming in with devices that had failed before and we were pleased to notice that the defects we found were really defects they found themselves. So far I don't think there is any objections. Everybody came in and said, "Well, we really are sorry that the devices failed, but we are submitting some others for retest because you were right." And that has been pleasing us because we didn't expect so much acceptance on our failures.

ASSEMBLYMAN WOLFRUM: Do you think the City of San Francisco is wrong in placing this device on their muni buses and having them on there for ten years?

MR. PAULA: Well, no, I wouldn't say that they are wrong, but it is actually quite difficult to find out if there was a failure and if the device operated or didn't operate. Suppose that they had a failure on a wheel, they still have several other wheels that will operate with brakes. The main issue is if the device operates at the time or long after the rupture occurred or what the size of the rupture was or any of these different things.

ASSEMBLYMAN WOLFRUM: The thing that I can't resolve in my own mind on this is that they have a hundred million miles of no runaway buses equipped with this device.

MR. PAULA: Well, the device wouldn't prevent exactly runaways. The device would shut off the wheels from the diaphragm through the system so as to prevent any further loss of air.

ASSEMBLYMAN WOLFRUM: If you lost the hose or the diaphragm, this wheel would not operate. It would shut off the air from that particular wheel, wouldn't it? You might have brakes left on three wheels.

MR. PAULA: But you also may have the device operating when it shouldn't be called to operate, and you wouldn't notice because you would have maybe three or four axles and you would have one of these devices in each of them. If one operates unduly and the other didn't, you won't notice that because you still have brakes, less brakes than you would have if you didn't have any device.

ASSEMBLYMAN WOLFRUM: A qualified operator ought to be able to tell whether he has three or four brakes operating.

MR. PAULA: Well, that is more than I can say. I don't know whether a qualified operator would recognize that or not.

ASSEMBLYMAN WOLFRUM: As I understand it, this device is probably one of the most reasonable as far as installation is concerned.

MR. PAULA: I certainly would think so, because it is very simple.

ASSEMBLYMAN WOLFRUM: This hasn't been a consideration at all in terms of the testing program?

MR. PAULA: Not as far as we are concerned, because the decision is made by the Highway Patrol. All we do is test it and present the results of the test. The patrol judges if the device is acceptable or not on the basis of the tests, but we don't influence any decision.

ASSEMBLYMAN WOLFRUM: Cost would seem to be an important factor if farmers, truckers, the government, and everybody else is going to have to buy these things.

CHAIRMAN GAFFNEY: If there is no objection, we will hold a special meeting on December 5 at the Richmond field station of the University.

FRANCIS LEIGHTON, CRANE COMPANY: There is a lot of conflict on this valve and there are certain basic things that should be understood: its original concept and its design. This particular valve is not smart enough to know whether a man is trying to bring a vehicle to a panic stop or whether he has a leak. The velocity principle on which this valve is based frightens the entire industry. That is why it has not received acceptance. The type of design involved here is actually poison to a vehicle.

We studied this valve and other valves. We have about 3½ million dollars worth of laboratories and gave this Nu-Valve a great deal of testing. You must consider the valve hitting a rut, the ball bouncing in the air and closing off the brakes. In designing equipment like this, the most important thing is that you don't shut off your brakes, and this valve is vulnerable to this condition. It is not a fail-safe valve and this is what frightens the entire industry. This is why there are conflicts: there are times when this valve will work and there are times when this valve will shut off the brakes when it shouldn't.

You have probably seen a vehicle come to a halt with the wheels locked and bouncing on the ground. If that occurs with this valve, the valve ball shuts off the flow and the wheels are released when they should be braked. I'm speaking purely from a light technical standpoint now, but basically a velocity type of valve of this sort is very dangerous.

We manufacture a valve that was approved by the patrol, and the cost is not much more than the Nu-Valve model. Ours allows the air to pass through the brakes when the driver steps on the brake, whether there is a leak or not in any wheel, in any hose, in any diaphragm. Then it takes another look and if there is a leak, shuts off the air.

ASSEMBLYMAN WOLFRUM: How did your valve get by the lag time on the tests?

MR. LEIGHTON: Anything you put in a system will have lag time, whether it is another length of hose or pipe or an elbow or a fitting. I believe the discussion here referred to too much lag time as far as the Nu-Valve is concerned.

ASSEMBLYMAN WOLFRUM: Your valve met 1/100ths of a second?

MR. LEIGHTON: Yes. We run oscillograph recordings on volume and time. Actually the type of tests that the laboratory ran are quite simple and were quite easy on the devices. Our own tests much exceeded the lab tests.

ASSEMBLYMAN WOLFRUM: Would there be any air left with a two second lag allowed by your valve?

MR. LEIGHTON: Yes, it takes quite a while to pump the air out. It concerns mostly a downhill long brake application, not ordinary city streets. That is another reason muni buses can get by in this condition, because any valve made may never function in the lifetime of the bus. It may never function unless you have a problem. If you work the bus

upside down or the truck upside down, it will still function. It doesn't know the difference. That is important in this valve, because the attitude and position of this valve affect its sensitivity. This is another concern of the industry. The Nu-Valve is a very simple device: all it has is a small ball in there. If you pass air over that ball, it will suck up the ball. If too much air goes over this ball, it sucks it up and closes off. The weight of the ball is in a normal position and if it is on an angle the ball weighs less.

ASSEMBLYMAN BELOTTI: After listening to Mr. Leighton, I think we should have tests on other valves to see the difference in operation.

CHAIRMAN GAFFNEY: That is all right with me. If there is another valve manufacturer, they are entitled to come in too.

MR. SCHEUERMANN: Has the lab retained all the valves it has tested?

MR. PAULA: No. After the test we retained one sample of the valves that were passed; if the valve was not passed, we gave back the three samples given us.

MR. SCHEUERMANN: But if on December 5 the committee wanted to see tests on other valves that have been approved, samples would be available at your lab?

MR. PAULA: Yes.

CHAIRMAN GAFFNEY: If it requires two or three different types to meet different requirements, I want those submitted, one that would operate effectively on a bus, one that would operate effectively on a heavy 80,000 pound semi-trailer rollong down the highway, etc.

MR. LEIGHTON: We make one valve to work on 500 pounds or over.

MR. FENT: You have been told that that will bounce. That was my first impression. But you put that valve on your desk and try to bounce your desk to make that ball move, and you can't. These valves are attached to the body of the coach and you can bounce all you want and

the ball will not come up. They have never proved it to bounce up. When it's attached to a mass that has inertia enough to offset the vibration of that valve, it will not bounce up. You can't bounce the coach hard enough. And as far as operating them upside down, I think the driver would be a little bit handicapped there. We can find some 19% and plus grades around here where it will still operate, so the attitude has very little to do with it.

ALAN ANDERSON: We opposed this bill because of its stiff language, because we were frightened that this might put a ceiling on engineering advancement. Following its passage, however, we immediately went to the Highway Patrol to discuss the rules and regulations that they would adopt. Along with many others we assisted the Highway Patrol in the formulation of these regulations, which we are now operating under. Our people are very well satisfied with the rules and regulations of the Highway Patrol. They are realistic. They are intended to provide greater safety and will reduce the number of accidents.

These brake devices are not the total cure for runaway accidents. If a driver puts on his brakes more and more going too fast downhill, pretty soon they start slipping a bit and the brake drum expands away and the brake shoes can't take up all the slack and therefore you have a runaway condition.

We are very happy that the Highway Patrol started out as quickly as they did with this program because they had no place to start from except for the advice that others gave them in setting up their test criteria.

There are about 1 million 100 thousand trucks in California, 300,000 of which would be equipped with airbrakes, including buses and so on. And as we buy 100 or 200 trucks at a time,we want to be sure that they are going to be equipped to last, and therefore we were very happy that the patrol stepped ahead as quickly as they did. As yet we have not

received any adverse remarks on the patrol's work.

There are other things which enter into this runaway problem. Maintenance of the brake system is a very important thing. In looking at the Highway Patrol statistics, less than 4% of the accidents are claimed mechanical failures. I think the trucks in California, either private and for hire, have excellent safety records, and we do maintain our vehicles on a constant schedule. Another very important factor is a program which has been in effect since 1957 to have steep grades posted for reduced speeds for trucks, to keep from getting into an overheated condition. Another very important factor is that many companies require their trucks to stop at the top of these steep grades and doublecheck the vehicle to make sure that everything is in order before they descend. Insofar as the Highway Patrol goes and the work that they have done, we support them.

CHAIRMAN GAFFNEY: Are you familiar with a device of amber lights on the dash for the chauffeur to test every brake on his equipment, and if the amber light doesn't show, he simply calls a mechanic over to fix his brakes. He doesn't start down the grade with a bum brake or maybe two or three bad brakes. This gadget doesn't have the okay of the patrol, but the Navajo lines have been using them for years, and they would have discarded it if it wasn't effective. It doesn't save the equipment on the way down the hill if the brake goes out or the air fails or anything, but up at the top of the hill it tells the driver whether it is safe to start down. Even in the terminal he tests his equipment and knows before he rolls out whether he has a safe vehicle.

MR. ANDERSON: Our people have looked at this system. I am familiar with it. I have heard only one really adverse comment on the use of this apparatus and that is that the driver may rely too heavily upon that device. If the light is burned out, then the driver relies on the fact that the brakes are all right, whereas in actuality, the brakes may be bad.

Regarding the time schedule we must meet, these regulations were adopted on September 15, thereby giving us from that date 18 months to comply. We see no problem in meeting the March 15, 1963 deadline because there are sufficient manufacturers providing enough approved devices for us to use.

BERT TRASK, CALIFORNIA TRUCKING ASSOCIATION: We have studied this problem of runaway trucks and brakes on trucks for many years and I think the biggest step we have taken to stop runaway trucks was to reduce the speed on the steep downgrades.

It is interesting to note that there were three fatalities during the first 15 months before they built the escape ramp on Five Mile Hill on the Ridge Route. They had 17 runaway trucks, and during the 15 months after they built the escape ramp there were two fatalities and 37 trucks used the ramp. That doesn't necessarily mean that they were completely out of control, but the ramp did help that many people.

As far as these devices are concerned and the law making them mandatory, I am not sure that we would have needed the law very much, because if any device is to our benefit and helps our safety record, we are going to put it on our trucks regardless of the law. Our bread and butter is in having good safety records and we cannot afford to have accidents. Actually, accidents from the loss of air pressure are only a fraction of 1% of the total. No device is going to stop all of the accidents; it is primarily up to the driver. If you have a good driver and he understands his equipment, he never has any trouble with it. If something is wrong with it, he reports it and he won't take the truck out and the Teamsters Union have instructed him not to take the truck out unless it is in good mechanical condition. To maintain the truck in good mechanical condition is the most important thing.

Most of the new trucks that are purchased by for hire carriers that have airbrakes have been equipped with approved devices for some time. Some companies have their fleets completely equipped to meet the Highway Patrol specifications as of right now. With some it will take a while yet before they get them all equipped. When you have a thousand or so trucks, sometimes it does take a long time. As to cost, if you try to convert an old truck and put these new devices on it, it is more expensive than if you have them put on at the factory. I met with a few truckers this morning and asked them how they were getting along on complying with the patrol regulations. They all said that they can comply within the 18 months.

One thing I would like to say about the tests conducted by the University--most people don't realize that the tests they have to conduct have to prove that these devices can operate in the coldest weather, the hottest weather, or anyplace else, because most of the trucks using these devices might go all over the United States. They used a basis of 10,000 applications for any one of these devices. Devices have to work under cold conditions, under hot conditions, under dirty conditions, under slush or grease; it was a big job to test these devices. When the committee gets a chance to see what they have done, you will be pretty well satisfied with the job they did in the length of time they did it.

I think the patrol did a real terrific job. We worked with them very closely. We went to about 9 or 10 different meetings with them, some of them lasting all day, and we worked on the regulations. We helped them all we could. It is going to be good for the industry and everybody concerned. The industry was a little reluctant at first to accept them, but now they realize that it is a good thing.

CHARLES WEARDEN, MAXIBRAKE, INC.: We have submitted our device

through the Department and have no complaints whatsoever in the method of testing. We had some units rejected which we resubmitted and they tested them without any trouble. We have had no trouble with the trucking industry in accepting our devices. As Mr. Trask has mentioned, the Department and the trucking industry would use devices that they felt were safe and would make their operation better on the highway.

ASSEMBLY INTERIM SUBCOMMITTEE
ON
TRANSPORTATION SAFETY

Edward M. Gaffney, Chairman

Conference Room
Institute of Transportation and Traffic Engineering
University of California Field Station
Richmond

10:00 a.m.
December 5, 1961

Members Present	Staff Members Present
Edward M. Gaffney, Chairman	Patricia A. Haag, Secretary
Frank P. Belotti	Bill Scheuermann, Consultant
Vernon Kilpatrick	Tom Guilino, Sergeant-at-Arms
W. Byron Rumford	
Chet Wolfrum	

CHAIRMAN GAFFNEY: (Following call to order and introduction of members and staff) This hearing is conducted under the authority and direction of House Resuolution No. 227 (1961 Regular Session) and is supplemental to the subcommittee's October 31, 1961, hearing in San Francisco. Today's meeting will be devoted to a discussion of and participation in laboratory and road testing procedures established to implement provisions of Section 26310 of the California Vehicle Code.*

At the San Francisco hearing, testimony showed that a particular compressed airbrake safety device in use by the Muni Railway for eight years was not approved by the California Highway Patrol based upon results of tests conducted by the Institute and the Patrol. Following a rather heated discussion, the subcommittee decided to give the manufacturers of this device another testing in the members' presence, and at the same time observe the testing procedures all devices governed by

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*This transcript has been condensed and edited by the subcommittee staff. A verbatim recording of the hearing is available for use in the committee office, Suite 4140 State Capitol, Sacrmento 14.

Section 26310 are put through by the Institute and the Patrol.

We have scheduled a brief orientation program first, then the lab and road testing, followed by a discussion and analysis session.

EARL T. ANDREWS, BENDIX-WESTINGHOUSE CORPORATION: My part of the program is to give you some explanation of the basic airbrake system and some of the safety features that are now required by regulation generally, and by California. These boards (indicating display) are very helpful in explaining the emergency system on tractor-trailers. The large board similates a basic airbrake system for a tractor and the smaller board is a similated semi-trailer.

The heart of the compressed air system is the compressor itself. It takes air in from the atmosphere, compresses it to a pressure, normally 100 pounds. That pressure is stored in a reservoir; this is the supply portion of the system. The pressure then goes into two tanks, a dry tank and a wet tank, and from there the supply is taken to the brake valve which is a graduating type valve to control the pressure to the foundation brakes. One line leads to the front axle to a key on to the brake chambers into a slack adjuster. The other line goes through to another key to carry the pressure to the rear brake chambers. Now brake chambers are just diaphragm actuators that develop a force that is put on the slack adjusters which transfers the force to the brakes.

Using this display, we'll build up the pressure in the system. Whem the pressure reaches 60 pounds the signal of pressure permits the driver to know that his system is above 60 and therefore it's fairly safe to move the vehicle. I say fairly safe, but actually he shouldn't move the vehicle until the pressure is built up to its maximum. And the maximum pressure is controlled by a governor which

is on the compressor or remote from the compressor. The control can give the driver anywhere from 5 pounds graduation up to 100 pounds graduation. The graduation depends upon the seat of the pants, depending upon what retardation of the vehicle he wishes.

The safety features in this system include a single check valve to protect the supply against a broken line in the discharge from the compressor to the reservoir; the low pressure indicator which notifies the driver he has at least 60 pounds in the system; a gauge on the dash that also tells the man visually that he has pressure in the system. On a trailer we have again the brake chambers, force slack adjusters, a reserve tank, and a relay emergency valve required by the Inter-state Commerce Commission since 1943.

This relay valve permits a faster application and release of the service brakes. The emergency portion was set up so that in case of a breakaway between the tractor and the trailer, the trailer would automatically apply its brakes and would not run away. In 1956 ICC required another feature which would shut off the air at 40 pounds and retain at least 45 to 20 pounds in the tractor which allows this driver to apply his tractor brakes, the automatic feature of the relay emergency valve. They also require that there shall be a second means of applying the emergency feature, a manual valve that will apply only the trailer brakes.

An airbrake system is not just put together with a lot of devices without being engineered. There are certain purposes, features or characteristics that have to be designed into the system, such as the specified reservoir volume, a standard practice of The Society of Automotive Engineers that gives you a displacement factor relative to the brake chamber volume. In other words, this reservoir would have to be large enough to take care of the brake

actuators and permit several applications in case of compressor failures. The ICC and the American Standards Association require that they be capable of applying the brakes five times without a source of power. The brake chamber itself is dependent upon the desired braking efforts and generally the front end has a smaller chamber than the rear end. This is engineered and it is a specification of the vehicle manufacturers.

The second thing is very, very important, the system itself, the transmission lines. The size of the lines are not just picked out of the air: the basic airbrake system is designed for safety without safety devices in it. We have to have a certain amount of capacity in the brake valve to develop force at these brake chambers at a certain rate. If you have a long wheel base vehicle, those lines may be 3/8" and then you would have to have a relay valve or something that would give you a faster application. The application and release is very important and when we're talking about being important, we're talking about the maximum buildup of pressure into the brake chambers in the order of 2/10 to 3/10 of a second. The release is in the order of maybe 6/10 of a second. This is a demand for controllability of the vehicle. The lines generally are checked out with testing and timing equipment, and the best combination is put on the vehicle and this also a demand from the vehicle manufacturers who want the best in performance in the system. On the rear axle of the trailer in combination vehicles, we expect in the order of 5/10 of a second where we have double bottoms and we have to put relay valves in the system to build the pressure up at the rearmost axle as fast as possible. This is generally around 6/10 of a second.

Now, the tractor protection relay emergency valve required by ICC and approved in California is to take care of the tractor-trailer combination for both parking and emergency. The spring brake actuators are a large spring that will develop the force into the foundation brake through the slack adjuster. To apply the spring brakes as an emergency brake, under a manual condition, the driver would pull the valve out and this would apply to both the spring brake and in this particular system in the display board, the trailer. Actually, with this system, he would have vehicle by vehicle protection. In a straight unit this would take care of the emergency situation. In tractor-trailers, this would also take care of the tractor and apply the relay emergency valve in emergencies.

ASSEMBLYMAN WOLFRUM: How many of the red devices on the display board are required by the State of California?

MR. ANDREWS: All of the red devices have been approved by the California Highway Patrol in accordance with Section 26310.

ASSEMBLYMAN WOLFRUM: Would lag time on one part of this system be between 2/10 and 3/10 of a second, and on the other part be 6/10 of a second?

MR. ANDREWS: That's right.

ASSEMBLYMAN WOLFRUM: Do you consider 6/10 of a second lag time to be excessive?

MR. ANDREWS: I would not consider that lag time. I would consider it transmission buildup time, which would be a very fine system that would build the pressure up to the maximum performance of the brake itself.

ASSEMBLYMAN WOLFRUM: Is the lag time you are talking about the same thing as transmission time?

MR. ANDREWS: The same thing.

ASSEMBLYMAN BELOTTI: Is there anything that could be added to improve the system to eliminate some of the runaway trucks?

MR. ANDREWS: I can't think of any other improvements that we can make that would improve the airbrake system that we have today. The biggest problem we have is maintenance of the airbrake system. The airbrake system in itself is vulnerable to failure, the foundation brake also is vulnerable to failure, and if the lining condition is poor, if the adjustment of the brakes is bad, then you can't expect the airbrake system to take care of the shortcomings of the service or foundation brake itself.

ASSEMBLYMAN GAFFNEY: The application would be a similar procedure on a Muni bus regardless of what device you use?

MR. ANDREWS: Yes. If they had spring brakes on a bus, the driver could apply the brakes although he may have lost his airbrake system.

ASSEMBLYMAN GAFFNEY: If an inexperienced driver burns out his brakes, will this safety valve counteract the expansion of the shoes and bring that vehicle to any reasonable stop?

MR. ANDREWS: No. We depend on the deceleration and the retardation between the tire and the road surface, and if the service brake itself is not capable of stopping that vehicle, the system has nothing to do with it.

J. R. ALMOND, MIDLAND-ROSS CORPORATION: We manufacture basically the same system Earl Andrews has adequately described, and I do not intend to comment on types of devices which we do not manufacture. One of our design objectives is to use only devices in a braking system that can be readily checked by the driver of the vehicle.

ASSEMBLYMAN BELOTTI: Are you satisfied with the way the Highway Patrol conducts the tests?

MR. ALMOND: Yes. Insofar as the type of devices which we manufacture, the Highway Patrol and the testing agency have set up test procedures which adequately screen such devices.

ASSEMBLYMAN WOLFRUM: Did you have an opportunity during the setting of the regulations to be heard in regard to what the regulations were going to be?

MR. ALMOND: Yes.

ASSEMBLYMAN WOLFRUM: Has your device been one of those approved by the Highway Patrol?

MR. ALMOND: We have had some devices approved and we have some still to be tested.

VERNON ANDERSON, GENERAL MANAGER, SAN FRANCISCO MUNICIPAL RAILWAY: The Municipal Railway has actually been a pioneer in this field of using safety devices in connection with airlines on buses. In 1952 the Municipal Railway equipment board recommended the installation of the safety device to block off the escape of air in the event of a broken diaphragm or an airline becoming ruptured. I am informed that the pneumatic safety check valve was thoroughly tested at that time by our staff and was selected for installation. Actual installation commenced in May, 1953, and proceeded thereafter. The pneumatic safety check valve has been used over a period of approximately 8 years with no known adverse effects. Our equipment department reports that during that period a few ruptures have occurred where the device has effectively sealed off escaping air and permitted a bus to be brought in safely. The Municipal Railway certainly shares your concern for safety and when an organization

is charged with the safety of transporting passengers, it is even more acute than in transporting freight.

The Municipal Railway, as a matter of policy, endeavors to be progressive and open-minded and receptive to warranted improvement. But our experience with this safety device over this eight year period, we believe, is quite significant: we've had no bus get away because of air failure during this period. We also believe that good maintenance is also very essential.

We did not hear first hand the results of the tests that were conducted but read about the tests in the press, and observed that the bus tested stopped the first time at 138 feet and the second time at 150 feet at 20 mph. We'll concede that we do not have the accurate testing devices that the state may possess, but in making the best tests we can, we will invariably be able to do much better than that. Not including reaction time, recent tests actually indicated stopping in approximately 15 to 22 feet at 20 miles per hour on level ground and equipped with the safety device that has been referred to.

CHAIRMAN GAFFNEY: Have you some specific instances where a bus lost air on a grade and this pneumatic valve came into play and saved that bus from an accident?

VERNON ANDERSON: We do not have those instances documented, but our Superintendent of Equipment has been told by members of his staff that ruptures have occurred and the bus has been brought in safely. The Municipal Railway is one of the very few transit systems that operates on grades as high as 18%, so we are, of course, concerned with the device that will be effective not only on the level but also on these steep grades when we're carrying heavy loads of passengers.

CHAIRMAN GAFFNEY: Particularly on the grades?

VERNON ANDERSON: Yes. When the approved list came out without our device on it, we were concerned and particularly in view of our experience with it. We are very anxious that a good and proper test be made inasmuch as our previous tests indicated that the bus has invariably stopped within the allowable distances, with and without the valve.

ASSEMBLYMAN RUMFORD: Do you feel that a good and proper test has not been had?

VERNON ANDERSON: We can't question the test that was made previously because we were not here. We believe that the bus will be brought to a stop in certain distances that are not comparable to these that were mentioned.

ASSEMBLYMAN RUMFORD: As far as safety and braking purposes, you believe the Nu-Valve is as efficient as you think it should be?

VERNON ANDERSON: We have found it satisfactory over a long period of time.

VICTOR PETERSON, SUPERINTENDENT OF EQUIPMENT, MUNICIPAL RAILWAY: In my experience there have been three instances called to my attention where the valves on a particular line had closed off the escape of air due to a ruptured diaphragm. This occurred in our shops and that was many years ago. As was stated earlier, any of these devices are a crutch. The number one thing is maintenance. We had in San Francisco for a long time a scheduled replacement of diaphragms on the front axle for one model every four months, for the rear axle every three months. We changed those diaphragms just to off-set any particular problem that might develop in the interim because we were not too sure about the quality of our merchandise;

that is, the rubber and things of that sort. We used over 10,000 diaphragms in six years just as replacement items to make certain that we wouldn't run them too long.

CHAIRMAN GAFFNEY: You are satisfied that this device has been a practical service to the Muni Railway in its operation?

MR. PETERSON: Yes. We have felt that the device functions the way it should. There's a difference in the two styles of devices under consideration today. One applies to brakes, the other shuts off the air.

ASSEMBLYMAN WOLFRUM: I fail to see the point of your statistical material on the replacement of diaphragms. Did you engage in a preventative maintenance program where you changed the diaphragms at a regularly scheduled interval?

VERNON ANDERSON: Yes.

ASSEMBLYMAN WOLFRUM: Are you still doing this?

MR. PETERSON: Yes, but our diaphragm material nowadays is so vastly superior to what it was 8 or 10 years ago that we get much better life out of the products now and they are much more substantial. But in this group, I couldn't tell you how many were on the verge of failure. This is merely the quantity that we used over that six-year period, 1952 to 1958.

ASSEMBLYMAN WOLFRUM: Are you basing some reliance on the Nu-Valve on your diaphragm expenditure?

MR. PETERSON: No, we still use the preventive approach. That is preferable in our case. We feel though, if something should occur, that the item will block off the air, if it should fail in that particular area.

ASSEMBLYMAN WOLFRUM: In other words, you believe then, if

you lost the air in your right front wheel you would still have it on the other wheels, that you would still have three brake shoes to control the vehicle that you wouldn't have if you didn't have it on there?

MR. PETERSON: That is right.

ASSEMBLYMAN WOLFRUM: How many buses do you operate?

MR. PETERSON: 500 diesel and gasoline buses.

ASSEMBLYMAN WOLFRUM: Are they all equipped with this Nu-Valve?

MR. PETERSON: Yes.

ASSEMBLYMAN KILPATRICK: This system that you are using is much less complicated than the ones displayed here, is it not?

MR. PETERSON: Yes.

ASSEMBLYMAN KILPATRICK: What is the cost of the installation of your product?

MR. PETERSON: I think when we started we paid somewhere around $4.00 apiece, so that would be $16.00 to equip the whole bus. I don't know what the price is now.

ASSEMBLYMAN WOLFRUM: You are also rebuilding this valve, aren't you?

MR. PETERSON: They are taken apart and inspected at regular intervals to see that there is no accumulation of any kind of crud or oils or contaminants that might be in the air, and washed out.

ASSEMBLYMAN WOLFRUM: Do you do this with some of your original valves?

MR. PETERSON: Yes, we had a part there that broke down on us so we have been going through all the older valves to see how this particular pin keeps the ball from moving back out and closing off the exhaust line as well as directing the flow of air. We had a

little problem in there that has been corrected in design. The replacement cost is fairly low; under normal conditions there is no wear on it.

ASSEMBLYMAN BELOTTI: Have you ever had the experience where you hit a little bump or a little rough place and the ball would automatically come up and shut off the air?

MR. PETERSON: No, but there is a valve designed for each size of the brake chamber. If we should reverse the valves, we would be lucky if we could stop the bus in time. If we didn't stop our bus any faster than 180 feet, we wouldn't be in business very long.

CHAIRMAN GAFFNEY: Mr. Taylor, were you properly notified that these tests were to be made:

RALPH TAYLOR, NU-VALVE CORPORATION, SAN FRANCISCO: Yes.

CHAIRMAN GAFFNEY: Did you submit to the testing authority the particular device that is used on the Muni Railway buses?

MR. TAYLOR: I believe we submitted all three.

CHAIRMAN GAFFNEY: Did you designate which was to be used on the bus testing and not on a truck and semi-trailer or some other vehicle?

MR. TAYLOR: We send with each valve typewritten or printed instructions exactly how they are to be applied and exactly how they are to be used and exactly on which type of equipment each valve is to be placed. That goes with every valve that is sold, and I am sure that all of these instructions went to the Highway Patrol.

CHAIRMAN GAFFNEY: The testing hinges on whether or not they used the proper valve on the test bus.

ASSEMBLYMAN BELOTTI: Your valve could be used on this brake device as set up on the display board:

MR. TAYLOR: Yes.

ASSEMBLYMAN BELOTTI: Where in this setup would it go?

E. J. KELL, NU-VALVE CORPORATION: Our device would go right here (indicating on display board). We protect the flex lines and the diaphragms because that is where most of the airbrake failures occur. If we have a ruptured diaphragm here, which has been the most vulnerable part, this valve would shut in here. In case there is a leak in this diaphragm, this ball will fly into position and shut this line off, and the braking system is working perfectly except that he has probably lost 3 or 4 pounds of pressure in his air tanks. In other words, he would still have 100 pounds pressure applied to the rest of the brakes.

This (exhibiting) is the valve we first submitted to the Highway Patrol. This is our most sensitive valve. It is called the "H" valve. This is made and as our instructions show, for the front brake chambers, which is a little 5½ inch brake chamber. The quick release is in the center of the bus; it has to go through a long copper tubing before it gets to the brakes so there is a lot of resistance in the line so this valve is very sensitive. As a matter of fact, this valve is 180 thousands higher because there is nothing but a plain ball in there. There is no maintenance except whenever they clean out their relay valves these valves are attached to it and they just unscrew them, clean them out and put them back in.

ASSEMBLYMAN KILPATRICK: What part of this system would be obsolete or unnecessary if your valves are used?

MR. KELL: This system could be used with my valves. For instance, if he had a brake line go or something, these valves here would go into place when the man pushed the button or his pressure got down to 45 pounds. With my valves included he would save that air. However, this (indicating display board) is a very excellent thing for any rig for what it was originally designed for and that's a parking brake. The reason for that is that when the vehicle is standing overnight they will all lose their air usually through their compressors and the driver will get in in the morning and might start that vehicle out before it's got sufficient air. Now with this parking brake on he cannot do that. His pressure will have to come up to about 60 pounds before he can mofe that vehicle because these brakes are on until that time.

I saw the bus today for the first time that the Highway Patrol tested this valve and got these abnormal readings. They put this sensitive valve on the rear chambers and I got onto the bus myself and looked at them and it was one of those rotor chambers, so you can about imagine how much air that takes. Naturally, these balls fles into position. Now, if they'd used our "S" valves, the balls would not fly in position because that ball is 180 thousands more than this one. They're all the same size valves. The only difference is the depth of the ball and then I have another W valve still 80 thousands lower that is for use on heavy construction.

ASSEMBLYMAN KILPATRICK: You were not invited to attend this test, is that right?

MR. KELL: Oh no. I didn't even know they had a test. As a matter of fact, they never even informed us that they held a test. The only time I heard about that was at your October 31st hearing.

CHAIRMAN GAFFNEY: But the point is the corporation that makes these valves certainly were invited to those tests and they submitted three models.

MR. KELL: No, we were not invited to those tests. I personally delivered these valves to the testing laboratory.

CHAIRMAN GAFFNEY: But without notification. In other words, you learned through press release or something that these tests were being made and you brought them over and submitted them for testing?

MR. KELL: No, the Highway Patrol notified us of the tests.

CHAIRMAN GAFFNEY: Then you were notified?

MR. KELL: We were notified, but we were not present at the time of the tests, nor were we present at the time it was put on the bus because I could have told them whenever they put this valve back on that rear brake, exactly what would happen. Now, if they put it on their front brakes where it should have gone, this valve would have worked perfectly.

CHAIRMAN GAFFNEY: Captain Jacobs, was there any regulation of the Patrol forbidding the presence of any interested party, inventor, manufacturer, user of a device at those tests? Were they open to the interested parties?

CAPTAIN H. K. JACOBS, CALIFORNIA HIGHWAY PATROL: I would say that it is very seldom if ever a manufacturer or inventor is actually present when the tests are conducted. However, when the results are made known to him, if he requests to review or take a look at the tests, he is always welcome. The University has done this many times, if they want to come in and see just what has happened. But I would say that the manufacturer or inventor, the person who applies for approval, is hardly ever present.

ASSEMBLYMAN KILPATRICK: Is this fact that they are welcome to be present and see the demonstrations made known to the different displayers?

CAPTAIN JACOBS: I don't know that we have published this, but we have had many manufacturers request to come in and see a review of the tests.

ASSEMBLYMAN KILPATRICK: They haven't been informed that this would be a privilege.

CAPTAIN JACOBS: No, I don't believe we've ever published this.

CHAIRMAN GAFFNEY: That was more on the point of expediency and getting the work done, not slighting any interested parties.

CAPTAIN JACOBS: There is no intention to slight anyone. The University does the testing. They do the tests in the order in which the devices are received and if they had to hold up a test until a manufacturer, for example, came out here from Detroit or New York, I doubt if we'd ever complete the tests.

ASSEMBLYMAN KILPATRICK: When it has become known that you are challenged, that you haven't used the right device, then what do you do next?

CAPTAIN JACOBS: I am not aware that we were challenged that we did not use the right device.

ASSEMBLYMAN KILPATRICK: You are being challenged today.

CAPTAIN JACOBS: We hope that the demonstrations today will take care of this challenge. I think there are many manufacturers here who will tell you that they have been present when tests were conducted in case there was any disagreement as to results, and they're always welcome to take a look.

MR. TAYLOR: We are positive that the testing today will prove that our device works perfectly.

CHAIRMAN GAFFNEY: Of the three types of valves that the company you represent manufactures, have you a model of the type applicable to Muni bus operations or any bus operations?

MR. TAYLOR: We have. We have brought one dozen of each type at the committee's request.

CHAIRMAN GAFFNEY: I want to know if you have the one that you have been using eight years on the Muni Railway for instance?

MR. TAYLOR: Yes sir.

MR. KELL: We're installing valves on patrol rigs right now.

ASSEMBLYMAN RUMFORD: How many valves were tested and how many rejected?

WARREN HEATH, AUTOMOTIVE EQUIPMENT TESTING ENGINEER, CALIFORNIA HIGHWAY PATROL: There are approximately 90 devices submitted and in the first group we approved only 56. Since then several have been submitted for re-testing. But out of the original group only 56.

ASSEMBLYMAN RUMFORD: Among that number was the Nu-Valve?

MR. HEATH: Yes.

ASSEMBLYMAN RUMFORD: Were those that did not pass of similar mechanical design?

MR. HEATH: There were only three or four of the same functioning as the Nu-Valve, the type that prevents loss of air through brake chamber. All the other types apply the brakes automatically upon loss of air.

(Whereupon the subcommittee adjourned to the Institute's laboratory and road testing areas for demonstrations of testing procedures and application of the particular compressed airbrake safety device under consideration, Nu-Valve.)

CHAIRMAN GAFFNEY: (Following subcommittee's reconvening in the Conference Room) For the record, these are the results of the series of tests performed this afternoon in the subcommittee's presence:

SAN FRANCISCO MUNICIPAL RAILWAY BUS WITH 21 PASSENGERS

Four Nu-Valve air loss valves installed as operated:

MPH	FEET TO STOP
17	38
18	80
18.5	44
20	33
20	40
20	39.5
18	35

No air loss valves installed:

MPH	FEET TO STOP
19	29
19.25	29.25
20	28.5
19.5	25.5

CHP BUS WITH 18 PASSENGERS

No air loss valves installed:

MPH	FEET TO STOP	REMARKS
19.5	43	No swerve
20	43	
20	44	
20	47	

Four Nu-Valve air loss valves installed by Nu-Valve mechanics:

MPH	FEET TO STOP	REMARKS
20	45	
20	61	Pulled badly to right
20	50	
20	57	Pulled badly to right
20	54	
20.5	58	

P.I.E. THREE-AXLE TRACTOR AND TWO- AXLE SEMITRAILER

No air loss valves installed in system:

MPH	FEET TO STOP
20	50
20	54

Nu-Valve air loss valves installed on all axles:

MPH	FEET TO STOP
20	54
20	55
20	55

One of the air lines to the brake chamber was disconnected. The brakes were gradually applied. The valve failed to operate and the air was exhausted through the open line.

FRANCIS LEIGHTON, CRANE COMPANY: I can't help but feel there is a very sincere effort on the part of the Nu-Valve people, the patrol, the laboratory, and certainly the respective manufacturers in the audience here, and there seems to be really a state of confusion, which is so basic: that there are millions of miles with a device that is quite satisfactory for the Muni buses but isn't good enough to face the patrol's requirements. Actually, there really is no confusion because of what I have seen this afternoon, it is an erratic piece of equipment. It works in some cases and does not work in others.

The last demonstration we witnessed outside should be of particular interest to the committee: you noticed on a slow application the valve continued to leak and on a sudden application it would shut off. When a truck has to come to a sudden stop, the valve is big enough to do that job and it will shut; however, you go down the Grapevine or any long hill and have a normal average application, you are going to lose your air because the valve does

not shut off. The valve is just too marginal to be used generally in the industry. You have to be very careful with it and use it properly for a particular chamber for a particular system, then it will work. There are other manufacturers that have made this type valve that have failed the test. I know one that has failed and he has gone back and made certain corrections and I believe he will be approved. If this valve can be improved upon, not be a marginal piece of equipment but a good general piece of equipment, I think this is what should be done.

MR. KELL: Because this is a velocity type valve, you can always beat it by using low air pressure. I was not pleased with the stopping distance tests on this bus, but I think this was due to the fact that they had a regular bus driver on there who applies the brakes as though he had a bunch of passengers. He doesn't make a hard stop line the PIE driver does. You don't do that on a bus. But on the last test, they got him coming down hard when they didn't have the devices on. Our previous tests where there was a mechanic driving, show that there was practically no difference in the stopping distance tests.

CHAIRMAN GAFFNEY: Will you state what the advantage of the valve is in your estimation as the inventor, as against some of the tests that show that the relative distances would be a greater distance to stop with the valve as against without the valve. What would be your estimation of the advantage in spite of such a test being factual and true?

MR. KELL: Naturally, when putting a valve or anything into a line you are going to get a little greater distance, probably one or two feet, because you put that much additional hose in it.

The advantages of my valve or any type velocity valve is a fact that the driver always has complete control of the vehicle. Even if he's had trouble and has had one or two broken lines as we demonstrated out there, he can still stop the bus, drive it on, keep on going or go anyplace he wants to. I think it was 10 or 12 feet further with no front brakes. That's naturally to be expected, he only had two brakes working. The rear, of course, is the heavier brakes. If he had had the rear brakes broken instead of the front brakes, he would have probably gone another 20 feet, but he would still have had control of the bus. The only reason we broke the front brakes is because that axle is a very small axle and we didn't want to do any damage to any equipment. With my device, the installation is a very minor detail and there's no maintenance. The valves are guaranteed for the life of the vehicle. In other words, they put them on and that's it. We explicitly state in our literature that the valve, however, does not take the place of preventive maintenance. You have to maintain any vehicle if you are going to keep it running, whether its got our valves on or not. But the maintenance of our valves is negligible compared to other devices.

CHAIRMAN GAFFNEY: Did you state at our last hearing that in 1950 the U.C. Laboratory had made a test of your invention and found it practical and that it is the very same valve without any added improvements?

MR. KELL: Yes. It's the very same valve we've had all along. I did change it to a double female because the male end was a weakness of the valve.

CHAIRMAN GAFFNEY: But the principle of the valve has not changed?

MR. KELL: It's exactly the same.

PROFESSOR D. J. FINCH, U. C. INSTITUTE OF TRANSPORTATION AND TRAFFIC ENGINEERING: The tests in 1950 were very similar to the ones you witnessed this afternoon on the PIE truck with a truck tractor and the trailer unloaded. The devices were placed on the rig and the device was then removed. Stopping distance tests were made under both of these conditions and as you observed today and as was reported in the test there was relatively little variation in the stopping distances in the two conditions of the test. This is the way the results came out and were recorded. The whole story is not told by one set of stopping distance measurements.

As you also have heard today, there can be devices placed on the vehicle which may or may not interfere with the braking operation and they may or may not perform as they are intended to perform. In other words, if they do not interfere with the operation, they may not shut off the line. On the other hand, if they do stop the line, they can under certain conditions of piping and so forth interfere with the braking operation. But it has been our problem here to determine just what can happen under conditions and we are making no recommendations about any of these things but recording facts to the Highway Patrol for their consideration. And I hope that we have been able to do this today.

These things require serious study and consideration. There may be situations where one can set up an engineering system which will work properly; there may be situations where this could cause difficulty, and these are the points that need to be brought out for your consideration. As far as the 1950 tests are concerned, they were factual; there are reasons why the systems operated that way and they are perfectly valid reasons. There is nothing wrong with the data except that it just doesn't tell the whole story.

MR. KELL: May I add one thing? In the testimony this morning you were asking Mr. Anderson if there were any records of this device saving any accidents on the hills. At the time of the Clay Street hill accident, the General Manager then, Mr. Miller, testified under oath that they had had three failures on the Clay Street hill, two by diaphragms and one by a hose, which were saved by these valves.

CHAIRMAN GAFFNEY: That accident was due to a ruptured air line?

MR. KELL: It was due to a burned hose. Well, it's the same thing. It's a ruptured air line or diaphragm. It doesn't make any difference how that air escapes if it escapes. The air is lost whichever way it goes out. And that's what our device is for, just to save those accidents and keep the vehicle under the control of the driver at all times.

CHAIRMAN GAFFNEY: There has been improvement since that accident. A cradle now keeps the hose from heated surfaces. That hose, if I remember, fell near the exhaust pipe and was ruptured through heat.

MR. KELL: That's right.

VERNON ANDERSON: Everyone of the stops that were made this afternoon were good stops and it also confirms that we did not experience any instance this afternoon where a Muni bus stopped in as much as 130 feet as had been experienced in the previous tests. We're very much concerned at the moment as to the status of the Muni. The difference in the tests with and without the valves at 20 miles per hour was approximately 3½ feet, which is a very, very small difference and we do believe now that the insurance that we have by reason of the valve being on the equipment and in a position to promptly take over, in the event of a failure, amply compensates for that small difference of about 3½ feet.

ALAN ANDERSON, PRIVATE TRUCK OWNERS BUREAU OF CALIFORNIA: I wanted to make an observation relative to the tests today. From what I could see of them, the Highway Patrol and the University of California have done a very outstanding job in testing these devices. A number of devices have been approved by the patrol. Our people are putting them on at the present time and are putting them especially on new vehicles as they are being purchased. A bill to permit the use of the device that was under scrutiny today was submitted to the 1957 Session of the Legislature, and the Senate Committee on Transportation studied the device and had it tested and I was a witness to that test. I didn't have the privilege of taking down any facts or figures. Those records are probably the property of the Senate and would be available to this committee.

At the time that the bill was under consideration, this telegram, dated May 22, 1957, was submitted to the Assembly Transportation and Commerce Committee: "I understand hearing due Thursday on AB 3735, covering proposed protection of motor vehicles using air-brakes to prevent air loss from airline break or diaphragm rupture. This bill as now amended was reviewed today during meeting of Joint Technical Engineering Committee of AMA and Truck Trailer Manufacturers Association, including engineers from all major air-brake manufacturing firms in the U.S. This committee believes it is familiar with all possible devices proposed in California for achieving this objective. The committee declares none of the known devices are desirable and actually under some conditions will prevent normal brake operation and are highly dangerous.

Truck and trailer manufacturers support auxiliary emergency braking protection now adopted by Federal ICC and strongly urge your

committee to insist on further tests before AB 3735 is approved. Our industry cannot accept the responsibility for operating safety of vehicles equipped with other than ICC approved brake protection devices and feel you should know we consider other methods highly dangerous after 7 years of careful testing." This wire is signed by Karl M. Richards, who was then Manager, Motor Truck Division, Automotive Manufacturers Association.

Since this wire in 1957 there have been other developments in velocity type check valves, and one of those at least has been approved, one by Crane Company, Hydroair. In testing these valves today, it would appear that there is an increased stopping distance when certain devices were placed in the airline system. I think it might be interesting that the braking system of the buses be carefully reviewed to determine how much air pressure is being used, what the size of the line is, what the size of the diaphragm and airpots are and the slack adjuster travel.

KARL RICHARDS, AUTOMOTIVE MANUFACTURERS ASSOCIATION: We are very concerned with braking of commercial vehicles and have committees working on this subject and developing devices and methods. We are very concerned not only with the effectiveness but the reliability of the braking systems and therefore, we've been extremely interested in this California situation. We are greatly concerned with the uniformity of requirements, so that one state doesn't become an island in its requirements. Vehicle movement is interstate, and these are our particular concerns.

CHAIRMAN GAFFNEY: Is there any research made by the Association toward perfection of a standard device and the installation at the point of manufacture of that device on heavy equipment trucks?

MR. RICHARDS: The protection system that we demonstrated to the ICC following the Clay Street accident was approved by the ICC as a vehicle by vehicle protection and, of course, this is put on all equipment destined for inter-state commerce. The ICC has its concern and we suggested to the committee when the bill was first introduced that they follow the ICC in this matter in the requirements in the state of California. Then there probably is possibility of uniformity and probably more rapid progress in this field. On the combination vehicles we are putting on at the factory this axle by axle protection system.

CHAIRMAN GAFFNEY: Has there been any advance in passenger cars for better braking systems?

MR. RICHARDS: I think the effort in that direction has been tremendous. Several committees have been out to our proving grounds and testing laboratories, have been shown some of the work that's been going on in this field. There's been a lot of misunderstanding in the passenger car field in brake performance. You're just about up to as fast a stop as you can get and reliability, of course, is a constant effort on the part of the manufacturers.

Our demands and our requirements are probably more exacting and more extensive than the testing of the California Highway Patrol. Our truck manufacturing companies have tested this particular device with which you are concerned today, and no company has found that it met its standards.

(WHEREUPON, THE SUBCOMMITTEE ADJOURNED AT 6:10 P.M.)